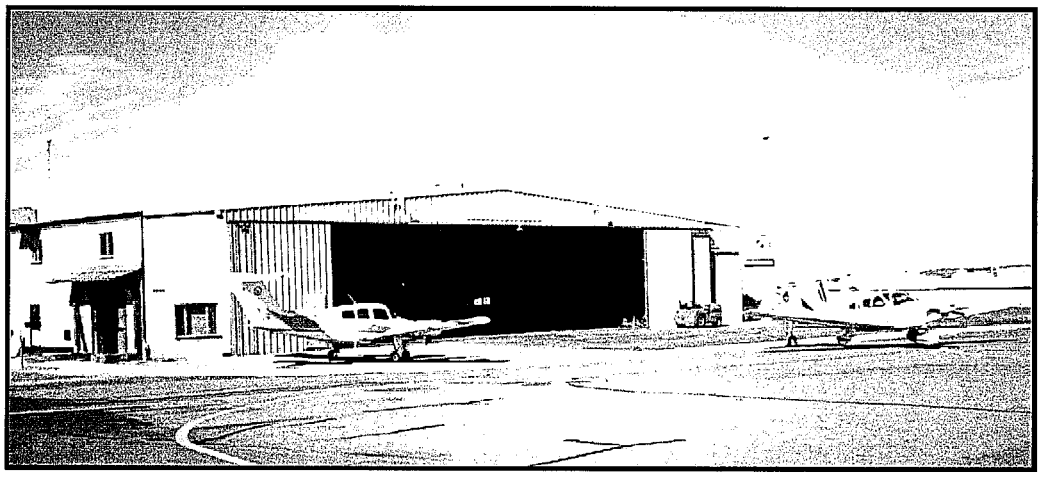
Chapter Three
DEMAND/CAPACITY AND/ FACILITY REQUIREMENTS

DEMAND/CAPACITY AND FACILITY REQUIREMENTS



To plan for the future of Ernest A. Love Field, it is necessary to translate forecast aviation demand into the specific types and quantities of facilities that will adequately serve these needs. This chapter uses established planning criteria to determine the airside (e.g., airfield capacity, runways, taxiways, navigational aids, marking and lighting), and landside (e.g., hangars, terminal building, aircraft parking apron, fueling, automobile parking and access) facility requirements.

Two fundamental planning procedures are utilized in the facility requirements analysis: the demand/capacity analysis, and the determination of airport development needs. The objective of this effort is to identify deficiencies in existing facilities and outline which new facilities will be needed to accommodate forecast demands. Having established the facility requirements, the next chapter will address alternatives for providing necessary facilities and evaluate the most cost-effective and efficient means for implementation.

AIRFIELD CAPACITY

METHODOLOGY

A variety of techniques have been developed for the analysis of airfield capacity. The current methodology, accepted by the Federal Aviation Administration (FAA) and employed in this study, is based on *FAA Advisory Circular 150/5060-5, Airport Capacity and Delay*. With this methodology, airfield runway capacity is described by the following three terms.

- **Hourly Capacity of Runways:** The maximum number of aircraft operations that can take place on the runway system in one hour.

- **Annual Service Volume:** The annual capacity or a maximum level of annual aircraft operations that may be used as reference in planning the runway system.

- **Annual Aircraft Delay:** The total delay incurred by all aircraft on the airfield in one year.

As indicated on **Exhibit 3A, Demand/ Capacity Methodology Factors**, the capacity of an airport is determined by several factors. Among these are airfield layout, meteorology, runway use, aircraft mix, percent arrivals, percent touch-and-go's and exit taxiway locations. Each of these elements and its impact on airfield capacity is discussed in the following paragraphs.

Airfield Layout

The airport layout refers to the location and orientation of runways, taxiways and the terminal area. As previously illustrated on **Exhibit 1C**, the layout of Ernest A. Love Field consists of a pair of parallel runways oriented northeast to southwest and a single crosswind runway oriented east to west. Parallel taxiways connect the runway system to the terminal area located in the southwest corner of the airport.

Meteorology

Weather conditions can affect runway utilization due to changes in cloud ceilings and visibility. When weather conditions deteriorate below Visual Flight Rule (VFR) conditions, the instrument capacity of the airport becomes a factor in determining airport capacity.

During Instrument Flight Rule (IFR) conditions, separations between landing and departing aircraft increase in length and the capabilities of the airfield system to accept operations is reduced.

The *Airfield Capacity and Delay Advisory Circular (AC 150/5060-5)* recognizes three categories of ceiling and visibility minimums. VFR conditions occur whenever the cloud ceiling is at least 1,000 feet above ground level and the visibility is at least three statute miles. IFR conditions occur whenever the reported cloud ceiling is at least 500 feet but less than 1,000 feet and/or visibility is at least one statute mile but less than three statute miles. Poor Visibility and Ceiling (PVC) conditions exist whenever the cloud ceiling is less than 500 feet and/or visibility is less than one statute mile.

At Ernest A. Love Field, VFR conditions occur approximately 98 percent of the time with IFR conditions being the remaining two percent. The available data on the annual percentage of VFR and IFR conditions for the region, was obtained from the National Weather Service data compiled at the airport.

94MP06-3A-7/15/96

AIRFIELD CAPACITY

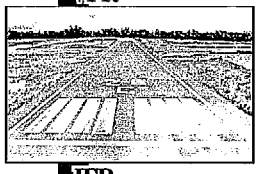
1 INPUT

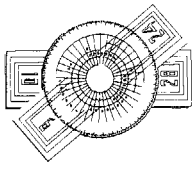
Airport Layout Meteorology Aircraft Mix Percent Arrivals Touch & Go's Exit Taxiways

2 PROCESS

Wind & Weather

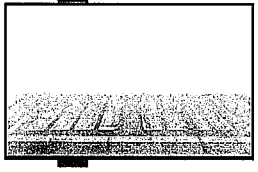
VFR



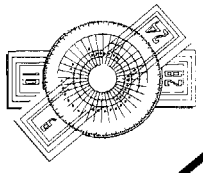


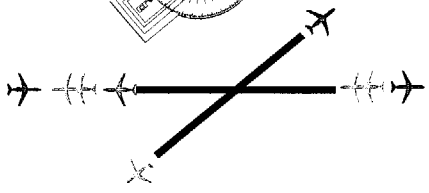
IFR

PVC

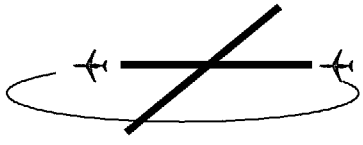


Runway Configuration

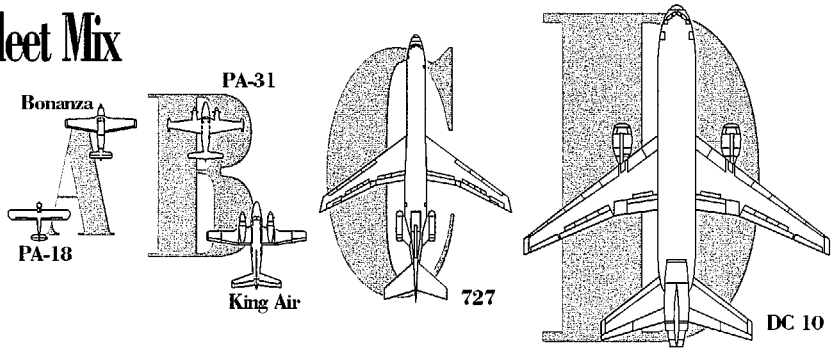




Touch & Go Factor

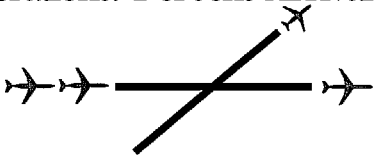


Fleet Mix



Exit Factor

Operations: Percent Arrivals



3 OUTPUT

Runway Hourly Capacity
Annual Aircraft Delay

ANNUAL SERVICE VOLUME

ERNEST A. LOVE FIELD

Exhibit 3A
DEMAND/CAPACITY METHOLOGY FACTORS

Aircraft Mix

The airside capacity methodology identifies four classes into which aircraft are categorized. Classes A and B include small propeller aircraft and jets, weighing 12,500 pounds or less. Class C generally consists of large business turboprop and jet aircraft, while Class D consists of larger jet and propeller aircraft generally associated with airline and military use. The aircraft operational mix used in calculating the capacity of Ernest A. Love Field, based upon the forecasts of aviation demand, is presented in **Table 3A, Aircraft Operational Mix Forecast**.

TABLE 3A
Aircraft Operational Mix Forecast
Ernest A. Love Field

	Aircraft Classification			
Year	**A**	**B**	**C**	**D**
1995	87%	11%	2%	0%
2000	85%	12%	3%	0%
2005	83%	13%	4%	0%
2010	81%	14%	5%	0%
2015	79%	15%	6%	0%
2020	77%	16%	7%	0%

Definitions	
Class A: Examples:	Small single-engine, gross weight 12,500 pounds or less Cessna 172/182, Mooney 201, Beech Bonanza, Piper Cherokee/ Warrior
Class B: Examples:	Small, twin-engine, gross weight 12,500 pounds or less Beech 1300, Cessna 402, Lear 25, Mitsubishi MU-2, Piper Navajo, Rockwell Shrike, Beech 99, Cessna Citation I, Beech King Air 100
Class C: Examples:	Large aircraft, gross weight 12,500 pounds to 300,000 pounds Douglas DC-9, Beech King Air 200, Boeing 727/737/757/767, Gulfstream III, Citation II, DeHavilland DH-8, Lear 35/55, Swearingen Metro, Beech 1900
Class D: Examples:	Large aircraft, gross weight more than 300,000 pounds Lockheed L-1011, Douglas DC-8-60/70, Boeing 747, Airbus A-300/A-310

Percent Arrivals

The percentage of arriving aircraft also influences the capacity of runways. In most cases the higher the percentage of arrivals during the peak period, the lower the service volume. At Ernest A. Love Field, there was no information that indicated a disproportionate share of arrivals to departures during peak periods; therefore, it was assumed that arrivals equaled departures during peak periods.

Touch-And-Go Operations

A touch-and-go operation refers to an aircraft which lands then makes an immediate takeoff without coming to a full stop or exiting the runway. These operations are normally associated with training and are classified as local operations. Touch-and-go's currently are estimated to comprise approximately 68 percent of all operations at Ernest A. Love Field. This percentage is expected to remain constant during the planning period.

Exit Taxiways

In addition to the runway configuration, the most notable characteristic considered in the airside capacity model is the number and types of taxiways available to exit the runway. The location of *exit* taxiways affects the occupancy time of an aircraft on the runway. The longer a plane remains on the runway, the lower the capacity of that runway. The aircraft mix index determines the distance the taxiway must be located from the runway end to qualify as an exit taxiway. Using the mix index criteria, each runway has at least two qualified exit taxiways.

CAPACITY ANALYSIS

The preceding information was used in conjunction with the FAA airside capacity model to determine the operational capacity at Ernest A. Love Field as mentioned earlier. Operational capacity is expressed in the following three terms.

- Weighted Hourly Capacity
- Annual Service Volume
- Annual Aircraft Delay

From these three findings, it is possible to determine the adequacy of the current airfield to accommodate potential demand scenarios and to determine the range of aircraft delay associated with each demand level.

WEIGHTED HOURLY RUNWAY CAPACITY

The first step in capacity analysis involves the computation of an hourly runway capacity during VFR and IFR conditions. Because IFR conditions increase separation requirements between aircraft, VFR hourly capacity is normally much higher. From these calculations, a weighted hourly capacity can be calculated.

The airfield capacity is also influenced by the runway configuration. Parallel runway systems provide greater airport capacity than a single runway or two intersecting runways. The weighted hourly capacity for the existing runway system at Ernest A. Love Field is 232 operations. This hourly capacity is expected to decrease over the planning period given no airfield capacity improvements.

ANNUAL SERVICE VOLUME

Once the hourly capacity is known, the *Annual Service Volume* (ASV) can be determined. ASV is calculated using the following equation:

$$ASV = C \times D \times H$$

C = weighted hourly capacity
D = ratio of annual demand to average daily demand during the peak month
H = ratio of average daily demand to average peak hour demand during the peak month

The existing weighted hourly capacity (C) for Ernest A. Love Field is 232 operations and is expected to decrease to 212 with no enhancements to airfield capacity. The daily demand ratio (D) is determined by dividing the annual operations by average daily operations during the peak month. The hourly ratio (H) is determined as the inverse of the percent of daily operations occurring during the peak hour. The data used for these ratios was based on the peaking characteristics developed in Chapter Two.

The ASV for Ernest A. Love Field's existing configuration is 432,400 operations. The ASV indicates that the airport is currently operating at approximately 80 percent of annual capacity and would be expected to increase to 118 percent of capacity by the year 2020.

ANNUAL DELAY

Even before an airport reaches capacity, aircraft operations begin to experience certain amounts of delay. Delays occur to arriving traffic that must wait in the VFR traffic pattern or in the IFR holding pattern, waiting their turn to land. Departing traffic must hold on the taxiway or the holding apron while waiting for the runway and final approach to clear.

As an airport's level of operations increases, delay increases exponentially. With 346,684 annual operations in 1995 at Ernest A. Love Field, aircraft experienced an average delay of approximately 2.8 minutes per aircraft operation. Actual delays to individual aircraft can be as high as ten times this average value. At present operational levels, total annual delay to aircraft at Ernest A. Love Field is approximately 16,179 hours. When the airport reaches 459,856 operations, as forecast for the year 2020, delays will average approximately 8.8 minutes per aircraft operation and will total approximately 67,446 hours annually.

In general, the FAA recommends consideration of development improvements to increase capacity when annual aircraft operations reach 60 percent of ASV and delays become excessive (greater than three minutes per aircraft operation). By the year 2000, operations at Ernest A. Love Field will reach 90 percent of the ASV, in addition, delays per operation will exceed 3.0 minute per operation.

CAPACITY AND DELAY SUMMARY

Table 3B, Airfield Demand/Capacity and Delay Summary, provides a summary of the operational capacity and delay analysis for Ernest A. Love Field. The Airport's operational capacity is a constraining factor to the future growth of the airport. Enhancements to airfield capacity will become an issue during the planning period and will be further examined in the Alternatives Chapter.

TABLE 3B
Airfield Demand/Capacity and Delay Summary
Ernest A. Love Field

Year	Annual Operations	Weighted Hourly Capacity	Annual Service Volume	Average Delay Per Operation (Minutes)	Total Annual Delay (Hours)
1995	346,684	232	432,400	2.8	16,179
2000	381,842	228	422,600	4.2	26,729
2005	405,094	224	414,300	5.4	36,458
2010	421,757	220	405,200	6.2	43,582
2015	443,750	216	397,700	7.2	53,250
2020	459,856	212	390,000	8.8	67,446

AIRSIDE FACILITY REQUIREMENTS

Airside facilities are those that are related to the arrival and departure of aircraft. These facilities are comprised of the following items.

- Runways
- Taxiways
- Navigational Aids
- Marking and Lighting

The selection of the appropriate FAA design standard for the development of airfield facilities is based primarily upon the characteristics of the aircraft which are expected to use the airport. The most critical aircraft characteristics are approach speed and the size of the aircraft anticipated to use the airport both today and in the future. The planning for future aircraft use is particularly important because design standards are used to determine separation distances between facilities that could be extremely costly to relocate at a later date.

According to *FAA Advisory Circular 5300-13*, aircraft are grouped into five categories based upon their certificated approach speeds.

Category A: Speeds less than 91 knots.

Category B: Speeds 91 knots or more but less than 121 knots.

Category C: Speeds 121 knots or more but less than 141 knots.

Category D: Speeds 141 knots or more but less than 166 knots.

Category E: Speeds 166 knots or more.

Categories A and B include small, propeller aircraft and certain smaller business jets. Categories C, D, and E consist of the remaining business jets as well as the larger jet and propeller aircraft generally associated with commercial and military use. The categories of aircraft expected to use the

Ernest A. Love Field during the planning period are Categories A, B, C, and D. While most aircraft operating at Ernest A. Love Field will fall into Categories A and B, the U.S. Forest Service and newer business jet aircraft will be in Categories C and D.

The same advisory circular also describes six Airplane Design Groups (ADG's) according to the physical size of the aircraft. The airplane's wingspan is the principal characteristic affecting airfield design standards.

Group I: Up to but not including 49 feet.

Group II: 49 feet up to but not including 79 feet.

Group III: 79 feet up to but not including 118 feet.

Group IV: 118 feet up to but not including 171 feet.

Group V: 171 feet up to but not including 214 feet.

Group VI: 214 feet up to but not including 262 feet.

The type of general aviation aircraft expected to use Ernest A. Love Field would range from ADG I to ADG III. Some of the aircraft used by the U.S. Forest Service and new business jet aircraft, however, are in ADG IV.

The Airport Reference Code (ARC) is a coding system used to relate airport design criteria to the operational and physical characteristics of the airplanes expected to operate at an airport. The ARC has two components to the airport design aircraft. The first component, is the aircraft approach category, (operational characteristic) and the second component is the ADG (physical characteristic). Generally, aircraft approach speed applies to runways and runway related facilities. ADG primarily affects the separation of airfield facilities.

Airport design criteria are more specifically determined by analyzing the aircraft mix and determining the most demanding airplane(s) to be accommodated. Although one type of aircraft may determine runway length, another may determine runway pavement strength or other appropriate design parameters. Airports with two or more runways may find it desirable to design all airport elements to meet the most demanding ARC. It may be more practical, however, to design secondary runway systems to a less demanding ARC. Based on the forecasts described in Chapter Two, and in accordance with the design criteria established in *FAA Advisory Circular 150/5300-13*, the primary runway at Ernest A. Love Field will have an **ARC** of **D-IV** throughout the planning period in order to accommodate the existing U.S. Forest Service fleet as well as the new business type aircraft. The crosswind runway, typically used by small aircraft, should accommodate **B-II** standards, while the parallel runway, typically used for small aircraft training activity, should accommodate **B-I** standards. The following paragraphs detail the criteria used to establish airfield dimensions and requirements.

RUNWAY

The adequacy of the existing runway system at Ernest A. Love Field has been analyzed from a number of perspectives, including runway orientation, airfield capacity, length, width and pavement strength. From this information, requirements for runway improvements were determined for the airport.

Runway Orientation

Wind conditions are of prime importance in determining runway orientation. Where prevailing winds are consistently from one direction, runways are generally oriented in that direction. In most areas, however, consistency of wind direction is not found. In such instances, a multiple runway system may be required. The Federal Aviation Administration (FAA) has established guidelines indicating that an airport runway system should provide 95 percent usability of the runway. The 95 percent wind coverage is computed on the basis of the crosswind not exceeding 10.5 knots for Airport Reference Codes (ARC) A-I and B-I, 13 knots for ARC A-II and B-II, 16 knots for ARC A-III, B-III, and C-I through D-III, and 20 knots for ARC A-IV through D-VI.

According to the all weather windrose illustrated on **Exhibit 1J, Windrose**, Runways 3R-21L and 2L-21R meets the recommended wind coverage. Although these runways meets the minimum crosswind coverage, there is a crosswind runway at Ernest A. Love Field to support the significant amount of training operations. It is therefore, recommended that the cross-wind runway be maintained at Ernest A. Love Field throughout the planning period.

Airfield Capacity

The evaluation of airfield capacity presented in the Capacity/Demand section of this chapter outlined the capacity of the airport at current and long term stages of the planning period. Operations at Ernest A. Love Field will reach a level at which planning for additional capacity should be given a priority consideration. The airport's ASV is currently 432,400 operations. The estimated operational level is currently about 80 percent of the ASV. It is expected that by the year 2020, at 459,856 annual operations, the airport will reach 118 percent of the ASV. As previously stated, the FAA recommends that steps be initiated to increase capacity when operational levels reach 60 percent of the ASV and delays become excessive. Airfield capacity enhancements will be further examined in the following chapter. In the case of Ernest A. Love Field, ERAU has indicated that as airport capacity becomes an operational constraint on their activity, they would most likely divert some training activity to other airports in the area. By ERAU diverting some training activity, Ernest A. Love Field's capacity may be enhanced.

Runway Length

The determination of runway length requirements for the airport are based on four primary factors.

- Critical aircraft type expected to use the airport
- Mean maximum daily temperature of the hottest month
- Runway gradient
- Airport elevation

The recommended length for a runway is determined by considering either the family of airplanes having similar performance characteristics or a specific airplane needing the longest runway. In either case, the choice should be based on airplanes that are forecast to use the runway on a regular basis. According to *FAA Advisory Circular 150/5325-4A - Runway Length Requirements for Airport Design*, a "regular basis" is considered to be at least 250 operations a year. An analysis of the existing and future fleet mix at Ernest A. Love Field indicates that large aircraft under 60,000 pounds would influence the required runway length. The existing primary runway length at Ernest A. Love Field is 7,616 feet.

According to the aforementioned FAA Advisory Circular, aircraft operating characteristics are affected by three primary factors. They are the mean maximum temperature of the hottest month, the airport's elevation and the gradient of the runway. The mean maximum temperature of the hottest month at Ernest A. Love Field is 88.9 degrees Fahrenheit. The airport elevation is 5,042 feet MSL and a runway end differential of the primary runway of 66 feet. **Table 3C, Runway Length Requirements**, outlines the runway length requirements for various categories of aircraft according to the most current FAA criteria. As shown in the **Table 3C**, the most demanding aircraft are large aircraft under 60,000 pounds. In order to accommodate 100 percent of these aircraft at 90 percent useful loading, a runway length of approximately 11,660 feet would be required. In order to accommodate 60 percent of these aircraft at 60 percent useful loading, a runway length of approximately 7,300 feet would be required. The existing runway length appears to be adequate for the existing aircraft fleet used by the U.S. Forest Service (USFS). Under certain conditions, however, additional runway length would be required or restricted takeoff weights utilized. The parallel runway and cross-wind runways should provide adequate length to accommodate small aircraft. According to **Table 3C**, a runway length between 4,620 feet and 6,370 feet would be required to accommodate 75 percent and 100 percent of small aircraft, respectively. The capability of providing these runway lengths at Ernest A. Love Field will be further examined in the Alternatives Chapter.

TABLE 3C Runway Length Requirements Ernest A. Love Field	
RUNWAY LENGTHS RECOMMENDED FOR AIRPORT DESIGN	
Small airplanes with less than 10 passenger seats	
75 percent of these small airplanes	4,620 feet
95 percent of these small airplanes	6,200 feet
100 percent of these small airplanes	6,370 feet
Small airplanes with 10 or more passenger seats	6,370 feet
Large airplanes of 60,000 pounds or less	
75 percent of these large airplanes at 60 percent useful load	7,300 feet
75 percent of these large airplanes at 90 percent useful load	9,260 feet
100 percent of these large airplanes at 60 percent useful load	11,160 feet
100 percent of these large airplanes at 90 percent useful load	11,660 feet
Reference: AC150/5325-4A, Runway length requirements for airport design.	

Runway Width

According to *FAA Advisory Circular 150/5300-13*, a minimum runway width of 150 feet would be needed to meet the D-IV standards over the planning period. The crosswind runway should be 75 feet in width to meet B-II standards, while the parallel runway should be 60 feet in width to meet B-I standards. It is recommended that the primary runway be maintained at the existing 150 feet, and the parallel and crosswind runways should be maintained at their respective widths.

Runway Pavement Strength

As previously identified in the Inventory Chapter, Runway 3R-21L has a pavement strength of 63,000 pounds single-wheel loading (SWL) and 80,000 pounds dual wheel loading (DWL). It is recommended that the pavement strength of the primary runway be increased to 150,000 pounds DWL in order to adequately accommodate the USFS aircraft fleet. The parallel and cross-wind runways are both rated at 12,500 pounds SWL, and should be maintained at this strength throughout the planning period. These pavement strengths would accommodate the anticipated aircraft fleet expected to utilizing Ernest A. Love Field during the planning period.

TAXIWAYS

Taxiways are constructed primarily to facilitate aircraft movement to and from the runway system. Some taxiways are necessary simply to provide access between the aprons and runways,

whereas other taxiways become necessary as activity increases at an airport to provide safe and efficient use of the airfield.

According to *FAA Advisory Circular 150/5300-13, Airport Design*, the taxiways serving Runway 3R-21L should be 75 feet in width and provide a 400-foot separation between the runway and taxiway centerlines. The taxiways associated with this runway are currently 50 feet in width, which should be increased in order to accommodate the aircraft mix forecast throughout the planning period. The current separation between the primary runway and the parallel taxiways is 400 feet.

The taxiways associated with the crosswind runway, Runway 11-29, should provide a 35-foot width with a runway-taxiway separation of 240 feet. The existing taxiways associated with the crosswind runway are 40 foot in width, however, the separation is 200 feet. Options available to the City of Prescott regarding the separation standard will be examined during the alternatives evaluations.

The taxiways associated with the parallel runway, Runway 3L-21R, should provide a 35-foot width with a separation of 225 feet. As with the crosswind runway, the taxiways associated with the parallel runway are 35 feet in width providing a 200-foot separation. Options available to the City of Prescott regarding the separation standard will be examined during the alternatives evaluations.

NAVIGATIONAL AIDS

Airport and runway navigational aid requirements are based on recommendations as depicted in *DOT/FAA Handbook 7031.2C, Airway Planning Standards Number One*, and *FAA Advisory Circular 150/5300-13, Airport Design*. Navigational aids provide visual, non-precision, or precision guidance to a runway(s) or the airport itself. The basic difference between a non-precision and precision navigational aid is that the latter provides electronic decent, alignment (course), and position guidance, while the non-precision navigational aid provides only alignment and position location information. The necessity of such equipment is predicated on safety considerations and operational needs. The type, purpose and volume of aviation activity expected at the airport are factors normally used in the determination of the airport's eligibility for navigational aids.

Currently, Ernest A. Love Field provides a nonprecision approach and a precision instrument landing system (ILS) approach. With the instrument approach equipment available, it is not anticipated that additional equipment will be required during the planning period. Additional Global Positioning System (GPS) capabilities, however, should be provided during the planning period.

Glide path indicator lights are a system of lights located on the side of the runway which provide visual descent

guidance information during an approach to the runway. Runway 3R-21L is equipped with a four-light Precision Approach Path Indicator (PAPI-4). The crosswind and parallel runway ends are equipped with PAPI-2. These systems provide adequate glide path lighting systems for the 20-year planning period.

In conjunction with the ILS on Runway 21L, a Medium Intensity Approach Lighting System with alignment indicator lights (MALSR) is installed. This system should be maintained throughout the planning period.

Runway End Identifier Lights (REIL's) are installed to provide rapid and positive identification of the approach end of the runway. REIL's are installed on Runway 3R-21L at Ernest A. Love Field at this time. This lighting system should be maintained throughout the planning period. REILs should be installed on each runway with an instrument approach.

MARKING AND LIGHTING

Lighting on runways, taxiways, and aprons is used to provide safety and security for aircraft movements during night operations. Medium Intensity Runway Lights (MIRL) are installed on all three runways. Also, the taxiways associated with the runway system provide Medium Intensity Taxiway Lighting (MITL).

Airport pavement markings are associated with the type of approach that can be conducted to that runway. Runway 21L is currently marked for precision approach capabilities, Runway 11 is marked for nonprecision approach capabilities, and the remaining runway ends are marked for visual approach capabilities. If additional GPS approaches are established, nonprecision or precision markings would be required for the associated runway end.

Exhibit 3B, Airside Facility Requirements, at the end of this chapter, provides a summary of the airside requirements discussed in this section.

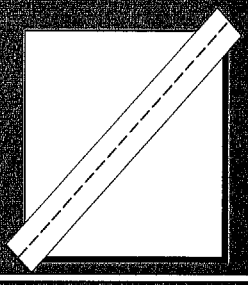
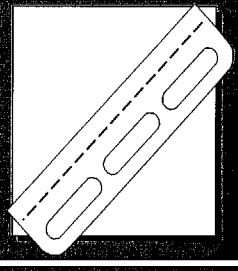
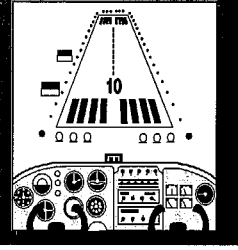
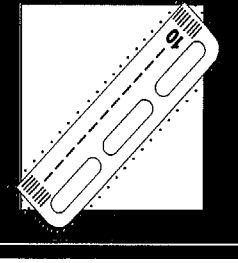
LANDSIDE FACILITY REQUIREMENTS

Components of the landside complex include the following types of facilities.

- Hangars/Shades
- Local and Itinerant Apron
- Terminal Building
- Vehicle Parking
- Fuel Storage

HANGARS/SHADES

The space required for hangar facilities is dependent upon the number and type of non-ERAU aircraft expected to be based at the airport. Based upon an analysis of general aviation facilities and the current demand at Ernest A. Love Field, percentages representing hangar requirements for various types of general aviation aircraft have been calculated.

	EXISTING	2000	2010	2020
RUNWAYS 	Runway 3R-21L 7616' x 150' 63,000 lbs SWL 80,000 lbs DWL Runway 3L-21R 4862' x 60' 12,500 SWL Runway 11-29 4408' x 75' 12,500 SWL	TO BE DETERMINED	SAME	SAME
TAXIWAYS 	Runway 3R-21L Full Parallel Exits Runway 3L-21R Full Parallel Exits Runway 11-29 Partial Parallel Exits	Runway 3R-21L SAME Runway 3L-21R SAME Runway 11-29 Full Parallel	Runway 3R-21L SAME Runway 3L-21R SAME Runway 11-29 SAME	Runway 3R-21L SAME Runway 3L-21R SAME Runway 11-29 SAME
NAVIGATIONAL AIDS 	Beacon, ATCT Runway 21L ILS GPS RNAV Runway 11 VOR GPS	SAME	SAME	SAME
LIGHTING and MARKING 	Runway 3R-21L MIRL, MALSR PAPI-4, REIL's Precision Runway 3L-21R MIRL, PAPI VISUAL Runway 11-29 PAPI, MIRL Non Precision Taxiways MITL, Centerlines	Runway 3R-21L SAME Runway 3L-21R SAME Runway 11-29 REIL's (11) Taxiways SAME	Runway 3R-21L SAME Runway 3L-21R SAME Runway 11-29 SAME Taxiways SAME	Runway 3R-21L SAME Runway 3L-21R SAME Runway 11-29 SAME Taxiways SAME

ERNEST A. LOVE FIELD

Exhibit 3B
AIRSIDE FACILITY REQUIREMENTS

Airports have been experiencing an increasing trend toward the use of T-hangars/shades by general aviation users. This trend can be attributed to the aircraft owner's desire to provide adequate protection from weather elements for their expensive aircrafts. The principal uses of conventional hangars on airports are for large aircraft storage, storage during maintenance and for housing fixed based operator's activities.

For planning purposes, it was assumed that 70 percent of the single-engine aircraft, 80 percent of the twin-engine aircraft and 100 percent of the helicopters and turbine powered aircraft would desire hangars at Ernest A. Love Field. It was also assumed that 10 percent of the single-engine aircraft, 25 percent of the twin-engine aircraft and 100 percent of the helicopter and turbine powered aircraft desiring hangars would be stored in conventional hangars.

A planning standard of 1,500 square feet (SF) was used for T-hangars. Space requirements for conventional hangar space were based on 1,000 SF per single- engine and rotary wing aircraft, 2,000 SF per twin-engine and turboprop aircraft, and 2,500 SF per turbojet aircraft. In addition, service or maintenance hangar areas were estimated at 10 percent of the total hangar storage area. This maintenance hangar area will be in addition to the individual hangar facilities.

Table 3D, Non-ERAU Forecast Hangar and Hangar Apron Requirements, outlines the projected hanger requirements throughout the planning period.

TABLE 3D
Non-ERAU Forecast Hangar and Hangar Apron Requirements
Ernest A. Love Field

	Available	1995	2000	2005	2010	2015	2020
Non-ERAU Based Aircraft	N/A	212	230	250	275	300	324
Aircraft to be Hangared							
Single-Engine	N/A	135	141	148	158	167	175
Multi-Engine	N/A	15	21	25	30	34	38
Turboprop	N/A	0	2	5	8	12	16
Business Jet	N/A	0	0	1	3	5	7
Rotorcraft	N/A	0	1	2	2	3	3
Total	N/A	150	165	181	201	221	239
T-Hangar/Shade Positions	**132**	**133**	**143**	**152**	**165**	**176**	**186**
T-Hangar Area (SF)	N/A	199,500	214,500	228,000	247,500	264,000	279,000
Conventional Hangar Positions	N/A	17	22	29	36	45	53
Aircraft Storage Area (SF)	N/A	21,000	29,600	41,800	56,300	73,200	89,000
Aircraft Maintenance Area (SF)	N/A	2,100	3,000	4,200	5,600	7,300	8,900
Total Conventional Hangar Area (SF)	**32,000**	**23,100**	**32,600**	**46,000**	**61,900**	**80,500**	**97,900**

NON-ERAU AIRCRAFT PARKING APRON

Adequate aircraft parking apron should be provided to accommodate those non-ERAU local aircraft not stored in hangars/shades as well as transient aircraft. At Ernest A. Love Field, there are separate tiedown areas for local and transient aircraft.

In determining future apron requirements, it is necessary to examine local and transient tiedown facilities as separate entities. The local apron should at least meet the demand established by the unhangared (and/or uncovered) based aircraft. The number of based aircraft requiring local tiedown facilities was determined and the results depicted in **Table 3E, Non-ERAU Forecast Apron Requirements**.

Transient parking requirements can be determined from a knowledge of busy day operations. The number of transient spaces required at Ernest A. Love Field was determined to be about 30 percent of the busy-day itinerant arrivals. A planning criterion of 34 square yards (SY) per local aircraft tiedown and 40 SY per transient aircraft tiedown was used for the analysis presented in **Table 3E**. According to the table, there is not a sufficient number of tiedowns at Ernest A. Love Field to meet the demand through the year 2020.

TABLE 3E
Non-ERAU Forecast Apron Requirements
Ernest A. Love Field

	Available	1995	2000	2005	2010	2015	2020
Total Tiedowns	**153**	**120**	**127**	**143**	**158**	**172**	**185**
- Local	114	62	65	69	74	79	85
- Transient	39	58	62	74	84	93	100
Total Non-ERAU Aircraft Apron (SY)	**N/A**	**4,400**	**4,600**	**5,300**	**5,800**	**6,300**	**6,800**

ERAU FACILITIES

In addition to the Non-ERAU hangar and apron requirements, ERAU aircraft will require conventional hangar space for maintenance and apron tiedown space. Currently, ERAU has one 10,000 SF hangar for aircraft maintenance purposes. The 45 ERAU aircraft utilizes apron tiedowns. There was no indication from ERAU that additional conventional hangar space would be necessary during the planning period, therefore, all ERAU aircraft would require apron tiedown space. Based on the estimate number of ERAU aircraft during the planning period, the number of tiedowns and apron space were estimated. **Table 3F, ERAU Hangar and Apron Requirements**, provides a breakdown throughout the planning period.

TABLE 3F
ERAU Hangar and Apron Requirements
Ernest A. Love Field

	Available	1995	2000	2005	2010	2015	2020
Convention Hangar (SF)	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Tiedowns	50	45	48	53	58	63	68
Total Apron (SY)	**N/A**	**13,500**	**14,400**	**15,900**	**17,400**	**18,900**	**20,400**

GENERAL AVIATION TERMINAL BUILDING

The general aviation terminal building serves several functions at an airport. Space is required for administrative and management offices, pilot's lounge and flight planning area, meeting facilities, food services, storage, restrooms, and various other needs. The size requirements may include more that one building (i.e., Airport Administration Building, FBO Buildings, etc.).

The methodology used to evaluate terminal building capacity generally calculates the square footage requirements for terminal facilities based on the number of design hour pilots and passengers forecast to use the facility. Space requirements were determined using 75 SF per design hour passenger. **Table 3G, Terminal Building Requirements**, outlines the space requirements for a general aviation terminal building facility at Ernest A. Love Field during the planning period.

TABLE 3G
Terminal Building Requirements
Ernest A. Love Field

	Available	1995	2000	2005	2010	2015	2020
Design Hour Pilots and Passengers	N/A	146	160	169	175	184	190
Terminal Building (SF)	**4,800[1]**	**11,000**	**12,000**	**12,700**	**13,100**	**13,800**	**14,300**

Note: [1] Square footage of existing Airport Administration Building

AUTOMOBILE PARKING

The requirements for automobile parking at general aviation airports are largely dependent upon the level of operations in addition to the type of general aviation facilities and activities at the airport. General aviation terminal area parking facilities are determined under guidelines set forth in FAA publications, while the number of automobile parking spaces for other general aviation facilities would be based on other factors.

The terminal public parking area requirements were based upon the number of design hour pilots and passengers. The total number of parking positions was projected based on a demand of 1.0 spaces per design hour passenger and 39 SY per automobile parking space.

General aviation parking requirements were calculated under the assumption that 20 percent of the based aircraft will require automobile parking positions at any one time. The amount of parking area required per space is the same as that used in determining terminal area parking requirements. **Table 3H, Public Vehicle Parking Requirements**, reflects parking facilities that are currently available and those that will be required in the future.

TABLE 3H
Public Vehicle Parking Requirements
Ernest A. Love Field

	Available	1995	2000	2005	2010	2015	2020
Pilots and Design Hour Passengers	N/A	146	160	169	175	184	190
Terminal Vehicle Spaces	95[1]	146	160	169	175	184	190
Parking Area (SY)	N/A	5,700	6,200	6,600	6,800	7,200	7,400
General Aviation Spaces	20[2]	51	57	66	72	78	83
Parking Area (SY)	N/A	2,000	2,200	2,600	2,800	3,000	3,200
Total Parking Spaces	**115**	**197**	**217**	**235**	**247**	**262**	**273**
Total Parking Area (SY)	N/A	7,700	8,400	9,200	9,600	10,200	10,600

Notes: [1] Total parking spaces adjacent to the Administration Building
[2] Total parking spaces adjacent to the North Hangar Complex

FUEL STORAGE

Fuel at airports is normally stored in underground tanks. This practice has undergone a great deal of scrutiny in the past few years because of the potential for fuel leaks and contamination of soil and groundwater. Consequently, the installation, design and monitoring requirements from both the State and Federal government, related to underground fuel storage, have increased significantly. The location of the fuel storage area depends upon the airport's operational activity and management procedures. A remote location of the fuel storage facility will require the use of a servicing vehicle to make the fuel available to the aircraft in the apron area.

Future fuel storage requirements for Ernest A. Love Field were projected following an analysis of the historical fuel use characteristics at the airport for the past year. The average rate of fuel consumption for 1995 was 2.6 gallons per operation. This ratio can be expected to increase slightly as the higher performance aircraft fleet increases.

Table 3J, Fuel Storage Requirements, provides a forecast of the monthly fuel storage capacity that will be required at Ernest A. Love Field. Storage requirements are based on a one month, on-hand supply; however, more frequent deliveries can reduce the fuel storage capacity requirement. As indicated in **Table 3J**, the current fuel storage capacity of 100,000 gallons is not adequate to meet the monthly fuel storage requirements at the present time. More frequent fuel deliveries may provide adequate capacity through the year 2020. It is recommended that an additional storage tank be installed for both 100LL and Jet A fuel, when the demand to maintain more of each of these fuels exists.

TABLE 3J
Fuel Storage Requirements
Ernest A. Love Field

	Available	1995	2000	2005	2010	2015	2020
Annual Operations	N/A	346,684	381,842	405,094	421,757	443,750	459,856
Peak Month Operations	N/A	38,489	42,666	45,348	47,247	49,747	51,597
Average Fuel Ratio	N/A	2.6	2.7	2.8	2.9	3.0	3.1
Monthly Fuel Storage Requirements	**100,000[1]**	**100,100**	**115,200**	**127,000**	**137,000**	**149,200**	**160,000**

Note: [1] Total Fuel Storage Currently Available

The landside facility requirements that should be developed during the planning period are illustrated in **Exhibit 3C, Landside Facility Requirements**, at the end of this chapter.

AIRLINE TERMINAL REQUIREMENTS

Components of the terminal area complex include the terminal building, gate positions and apron area. The following discussion outlines the facilities required to meet the terminal needs at Ernest A. Love Field throughout the planning period.

The analysis of facility requirements for various terminal complex functional areas at the Ernest A. Love Field was performed within the guidelines of *FAA AC 150/5360-9, Planning and Design of Airport Terminal Facilities at Nonhub Locations*. This document was used along with results of inventory, forecast, and demand/capacity to prepare estimates of various terminal building requirements.

Facility requirements were developed for the planning period based upon enplanement levels projected for the 20-year planning period. It should be noted that actual construction of any of the facility requirements should be

related to the enplanement levels rather than the forecast year.

AIRLINE TERMINAL BUILDING

The size of the terminal building will depend upon the type of airline operations it must accommodate as well as the peak activity periods that can regularly be expected. As discussed in the Forecast Chapter, commercial airline service is expected to not only continue, but expand throughout the planning period.

Utilizing the criteria established in the aforementioned FAA Advisory Circulars, the minimum gross size of the commercial service terminal building was estimated. **Table 3K, Commercial Service Terminal Building Requirements**, depicts the recommended minimum gross size of the terminal building based upon the forecast enplanement levels. According to the table, the current commercial service terminal building is less than the size recommended for the current usage. A larger airline terminal building is, therefore, recommended over the short-term. Due to the projected enplanement levels, the design of this facility should allow for its continued expansion to approximately 8,300 square feet.

Public Waiting Area

The public waiting area is the designated waiting area for passengers immediately prior to boarding an aircraft. This area includes the lobby, circulation, security screening, and departure areas. The public area requirements are generally based on design hour activity, gate requirements and fleet mix projections. The Ernest A. Love Field currently has a small departure lounge within the terminal building, however, it is not separated from the lobby and ticketing area.

Table 3K depicts the lobby waiting area requirements for the commercial airlines. The lobby waiting area at Ernest A. Love Field should be approximately 600 square feet by the end of the planning period.

Airline Support Areas

Airline ticket counter, length, counter area, airline ticket office, ticketing lobby, and baggage handling area requirements were calculated in accordance with *FAA Advisory Circular 150/5360-9*. These requirements were based upon peak hour activity. **Table 3K** outlines the airline ticketing/operations requirements for the Ernest A. Love Field over the twenty year planning period. Approximately 1,000 square feet will be needed by the end of the planning period.

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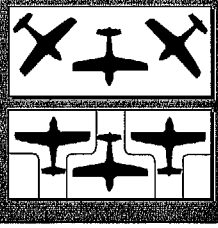
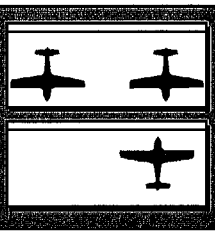
HANGARS



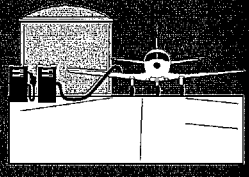
	EXISTING	2000	2010	2020
NON-ERAU T-Hangars/Shades	132	143	165	186
Conventional Hangar (S.F.)	32,000	32,600	61,900	97,900

APRON TIE-DOWNS



	EXISTING	2000	2010	2020
NON-ERAU Local Ramp Positions	114	65	74	85
Transient Ramp Positions	39	62	84	100
Total Apron Area (S.Y.)	N/A	4,600	5,800	6,800

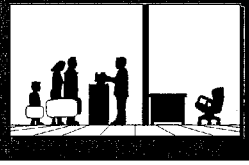
FUEL STORAGE



	EXISTING	2000	2010	2020
Monthly Fuel Storage Requirements (Gallons)	100,000*	115,200	137,000	160,000

*Existing On-Airport Capacity

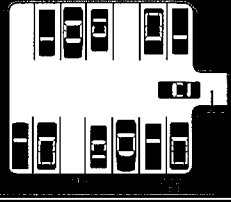
GENERAL AVIATION TERMINAL



	EXISTING	2000	2010	2020
Total Terminal Area (S.F.)	4,800*	12,000	13,100	14,300

*Existing Administration Building

AUTO PARKING



	EXISTING	2000	2010	2020
Total Parking Spaces	115	217	247	273
Terminal	95	160	175	190
General Aviation	20	57	72	83
Total Area (S.Y.)	N/A	8,400	9,600	10,600

ERNEST A. LOVE FIELD

Exhibit 3C
LANDSIDE FACILITY REQUIREMENTS

Baggage Claim Facilities

Baggage claim facility requirements are depicted in **Table 3K**. These were based upon the anticipated peak hour activity at Ernest A. Love Field during the planning period.

It is estimated that approximately 600 square feet of baggage claim area will be needed by the end of the planning period. A baggage claim counter of 10 feet is also anticipated to be needed by the year 2020.

Food, Beverage, and Terminal Services

Food, Beverage, and Terminal Services include passenger and visitor-oriented amenities, concessions and services other than those provided by the airlines. For planning purposes this area includes rental car companies, retail shops, vending machines, restrooms, security, concessions, and maintenance and storage operations. It is expected that approximately 750 square feet will be needed by the end of the planning period. **Table 3K** outlines the terminal services facility requirements throughout the planning period.

TABLE 3K
Commercial Service Terminal Building Requirements
Ernest A. Love Field

	Available	1995	2000	2005	2010	2015	2020
Annual Enplanements	N/A	10,256	15,000	22,000	27,000	33,000	40,000
Design Hour Enplanements	N/A	5	8	11	14	17	21
Peak Hour Passengers	N/A	13	20	28	35	43	53
Terminal Building Elements							
Public Waiting Area	N/A	500	540	580	620	660	700
Airline Ticketing/Operations	N/A	500	600	800	900	1,000	1,100
Ticket Lobby	N/A	100	110	120	130	140	150
Ticket Counter (LF)	N/A	4	5	6	8	9	10
Baggage Claim Area	N/A	400	430	460	500	530	560
Baggage Claim Counter (LF)	N/A	15	16	17	18	19	20
Food, Beverage and Terminal Services[1]	N/A	1,700	2,020	2,340	2,450	2,770	2,990
Airport Management	N/A	2,000	2,000	2,500	2,500	3,000	3,000
Minimum Total Area (SF)	**3,800[2]**	**5,200**	**5,700**	**6,800**	**7,100**	**8,100**	**8,500**

Notes: N/A - Not Applicable
[1] Terminal Services includes area for rental cars, retail shops, vending machines, restrooms, security, concessions, circulation, and maintenance and storage.
[2] Existing terminal building size, including restaurant
Source: *FAA Advisory Circular 150/5360-9*, Planning and Design of Airport Terminal Facilities at Nonhub Locations.

AIRLINE GATE POSITIONS AND APRON AREA

At the present time there are two aircraft parking gate position at the Ernest A. Love Field. As enplanements increase during the planning period, gate requirements will include a aircraft parking gate capable of accommodating a regional type aircraft with a seating capacity of at least 30 seats. **Table 3L, Airline Gate and Apron Area Requirements**, depicts the number of gates anticipated throughout the planning period.

TABLE 3L
Airline Gate and Apron Area Requirements
Ernest A. Love Field

	Available	1995	2000	2005	2010	2015	2020
Peak Hour Passengers	N/A	13	20	28	35	43	53
Commuter Aircraft Gate Positions (aircraft with 19 seats or less)	2	2	2	2	1	1	1
Apron Area (SY)	N/A	2,000	2,000	2,000	1,000	1,000	1,000
Regional Aircraft Gate Positions (aircraft with 30+ seats)	N/A	0	0	0	1	1	1
Apron Area (SY)	N/A	0	0	0	1,500	1,500	1,500
Total Gate Positions	2	2	2	2	2	2	2
Total Apron Area (SY)	N/A	2,000	2,000	2,000	2,500	2,500	2,500

Notes: N/A - Not Applicable

The size and configuration of the airline apron will vary with the level of airline service. A commuter airline generally can be expected to operate smaller aircraft with less than 30 passenger seats, however, the larger regional aircraft can seat 30 or more passengers. According to the table, the existing apron area at the Ernest A. Love Field will not be adequate to meet the demand through the planning period. Consideration should, therefore, be given to providing additional apron area as the demand warrants.

Airlines serving Ernest A. Love Field primarily serve origin-destination traffic with minimum numbers of connecting passengers; therefore, a linear concept gate area with a minimum distance from curb to gate would work best. In this configuration, the aircraft would pull up to the face of the terminal building to load and unload passengers. The aircraft could then power-out or be pushed back from the gate for departure.

AUTOMOBILE PARKING

Vehicle parking in the terminal area includes those spaces utilized by passengers, visitors and employees. Parking spaces are classified as public, employee, and rental car.

Requirements for public and rental car parking are dictated by origin-destination passenger levels and the availability of other modes of ground transportation. Employee parking is dependent upon total passenger levels.

The requirements for public vehicle parking was determines using *Advisory Circular 150/5360-9, Planning and Design of Airport Terminal Facilities at Nonhub Locations*. Approximately 80 public parking spaces are needed by the end of the planning period. Employee parking was determined to be 20 percent of the spaces needed for public parking and rental car requirements were determined to be 35 percent of public parking. Each parking space will require approximately 39 square yards of area for parking and maneuvering. **Table 3M, Airline Terminal Automobile Parking Requirements**, depicts the results of this analysis. According to the table, additional parking at Ernest A. Love Field should be considered over the long-term.

TABLE 3M
Airline Terminal Automobile Parking Requirements
Ernest A. Love Field

	Available	1995	2000	2005	2010	2015	2020
Annual Enplanements	N/A	10,256	15,000	22,000	27,000	33,000	40,000
Public Parking Spaces	N/A	30	40	50	60	70	80
Employee Parking Spaces	N/A	6	8	10	12	14	16
Rental Car Parking Spaces	N/A	11	14	18	21	25	28
Total Parking Spaces	112[1]	47	62	78	93	109	124
Parking Area (SY)	N/A	1,800	2,400	3,000	3,600	4,300	4,800

Note: 1 Total parking spaces adjacent to terminal building
N/A - Not Applicable

If paid parking is established, the public lot is typically subdivided into short and long term parking areas. The short term parking lot is located most conveniently to the terminal building and parking rates are higher than in the long term lot. Approximately 20 percent of all public parking should be designated as short term parking.

The commercial aviation facility requirements that should be developed during the planning period are illustrated at the end of this chapter in **Exhibit 3D, Commercial Service Facility Requirements**.

AIRPORT ACCESS

Access to Ernest A. Love Field is provided from State Route 89A via three access roads: MacCurdy Drive, Larry Coldwell Drive, and Ruger Road. It is anticipated that improvements to these access roads will be necessary during the planning period, due to

increase use of the airport facilities. Options available to the City of Prescott to enhance access to the airport will be further examined in the following chapter.

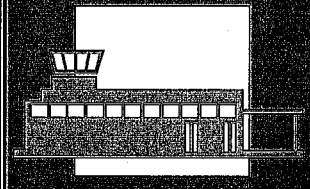
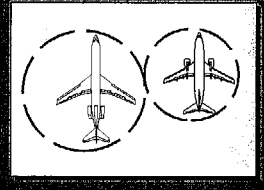
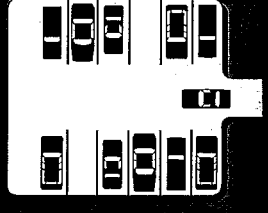
SUPPORT FACILITIES

Airport support facilities are those that are not classified as airside or landside facilities, but do play an important role in the function of the airport. Of most concern will be the availability of utilities serving the airport. Expanded facilities at the airport will result in additional utility usage. Expansion of the existing systems may be required for further airport improvements.

SUMMARY

The intent of this chapter is to outline the facilities required to meet "unconstrained" aviation demands projected at Ernest A. Love Field through the year 2020. A summary of airside and landside facility requirements are presented on **Exhibits 3B, 3C, and 3D**.

The next step in the master planning process is to develop a direction for development to best meet these projected needs. The remainder of the master plan study will be devoted to outlining this direction, its schedule, and the associated costs.

	EXISTING	2000	2010	2020
TERMINAL BUILDING				
	Total Area (S.F.) 3,800*	5,700	7,100	8,500
	* Existing Terminal Building			
TERMINAL GATE POSITIONS				
	Commuter Gates 2	2	1	1
	Regional Gates 0	0	1	1
AUTO PARKING				
	Total Parking 112	62	93	124
	Total Area (S.F.) N/A	2,400	3,600	4,800

ERNEST A. LOVE FIELD

Exhibit 3D
COMMERCIAL SERVICE REQUIREMENTS